Hybrid Nanocomposites for Lithium Battery Cathodes

Developed ternary hybrid nanocomposites have a guest-host structure and include:

- inorganic nanoparticles i.e. layered vanadium oxide particles of around 10nm in size;
- electron-conducting polymer (polyaniline, polypyrrole), the macromolecules of which are mainly located inside the inorganic nanoparticles;
- ion-conducting polymer (poly(ethylene oxide)), whose chains are located both inside and outside of the inorganic nanoparticles.

The simultaneous presence of both electron-conducting and ion-conducting polymers inside the inorganic nanoparticles, in the form of a layer (0.5–0.6 nm thick), is a distinctive feature in comparison with known hybrids and provides for improved efficiency of charge-discharge cycling.

Can be used as an active component of the cathode in lithium batteries. Targeted discharge capacity is 200-250 mA·h/g which considerably exceeds the characteristics of presently used cathode materials.

Hybrid Nanocomposites for Light-Emitting Diodes

Hybrid nanocomposites based on organic semiconductors and inorganic matrices that are applicable in light-emitting diodes and displays.

Semiconducting conjugated polymer (MEH-PPV) and inorganic mesoporous silica (MCM-41) were used as the basis for the developed nanocomposite. The content of the organic component in the developed nanocomposite is 15wt% which well exceeds known international prototypes. Organic macromolecules are confined inside the channels of the mesoporous inorganic matrix that results in improved efficiency of electroluminescence and environmental stability.

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